國　立　宜　蘭　大　學

１０７學年度研究所碩士班考試入學

輸送現象與單元操作試題

（化學工程與材料工程學系碩士班）

准考證號碼：

《作答注意事項》

1.請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。

2.考試時間：100 分鐘。

3.本試卷共有四大題，共計 100 分。

4.請將答案寫在答案卷上。

5.考試中禁止使用手機或其他通信設備。

6.考試後，請將試題卷及答案卷一併繳交。

7.本試卷採雙面影印，請勿漏答。

8.本考科可使用非程式型（不具備儲存程式功能）之電子計算機。

(一)單選題：每一小題 5 分，共 40 分

1. 孔口板差壓式流量計，計算體積流率為 $Q=\frac{CA_2}{\sqrt{1-\beta^4}}\sqrt{\frac{2(P_1-P_2)}{\rho}}$ ，其中 C 值若在雷諾數很高時，應為多少？

(A) 0.98

(B) 0.89

(C) 0.75

(D) 0.61

2. 若攪拌槽直徑為 298 mm ，葉片直徑為 95 mm ，轉速為 150 rpm，扭矩為 0.3Kg_f cm，計算動力 P 為多少 J/sec？(1 Kg_f = 9.8 N)

(A) 46.18

(B) 27.71

(C) 4.712

(D) 0.462

3. 同上數據，計算雷諾數 N_{Re} ？

(A) 1.354×10^6

(B) 2.375×10^5

(C) 2.256×10^4

(D) 1.735×10^3

4. 流體比熱 $4180\frac{KCal}{Kg\cdot^oC}$ 、黏度 $0.581\,cP$ 、密度 $994\frac{Kg}{m^3}$ 、熱傳導度 $2290\frac{KCal}{m\cdot hr\cdot^oC}$ ，求普蘭特數 Pr 為多少？

(A) 1814

(B) 3.82

(C) 1.06

(D) 0.318

5. 熱傳導係數由大至小排列應為？

(A) 固體 > 液體 > 氣體

(B) 液體 > 氣體 > 固體

(C) 液體 > 固體 > 氣體

(D) 氣體 > 液體 > 固體

6. 泰勒標準篩其相鄰的兩個網號的孔徑比為？

(A) $\sqrt[2]{2}$

(B) $\sqrt[2]{4}$

(C) $\sqrt[4]{2}$

(D) $\sqrt[4]{4}$

7. 砂以泰勒標準篩做粒徑分析得實驗數據如下:孔徑 1.00mm 盤上 10%、0.85mm 盤上 40%、0.70mm 盤上 30%、0.50mm 盤上 20%，則試樣在 0.85mm 的通過率為多少%？

(A) 20%

(B) 30%

(C) 50%

(D) 60%

8. 液體擴散係數的單位為？

(A) m

(B) $\frac{m}{\sec}$

(C) $\frac{m^2}{\sec}$

(D) $\frac{m^2}{Kg \cdot \sec}$

(二)解釋下列名詞並簡要說明名詞意義：每一小題 5 分，共 20 分

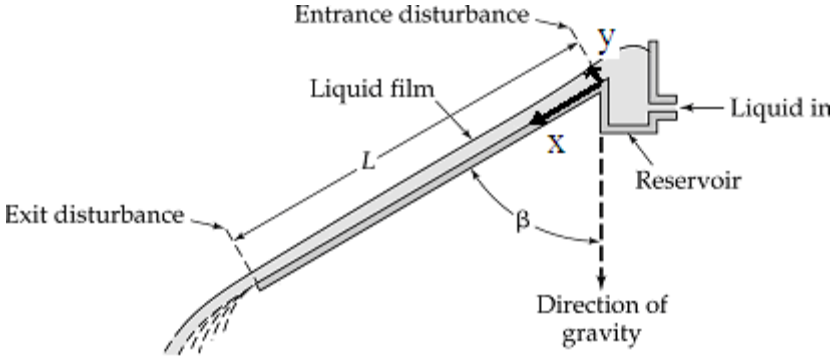
1. adsorption

2. desorption

3. leaching

4. distillation

(三) A wetted-wall plate, we discuss is that of the flow of a liquid down an inclined flat plate of length L and width W, as illustrated in figure, involves both momentum and mass transfer. In this operation, a thin liquid film flows along the wall of the plate while in contact with a gas mixture. The time of contact between the two phases is relatively short during normal operation. As only a small quantity of mass is absorbed, the properties of liquid are assumed to be unaltered. The velocity of the falling film will thus be virtually unaffected by the diffusion process. Set up momentum balance over a shell of thickness Δx and Δy in the film. (a) Applying the shell balance method at the steady-state, list the simplifying assumptions, and propose reasonable boundary conditions. (b) Derive that the velocity distribution in the falling film. (c) Develop that the differential model to describe the mass transfer process. (20%)



（四）The steady- state diffusion process through a hypothetical spherical stagnant gas film surrounding a droplet of liquid A. The spherical droplet of A is illustrated in Figure, which component A vaporizes and diffuses that the rate of vaporization may be physically measured and may also be mathematically expressed in terms of the molar mass flux. The liquid surface is kept constant at R_1, which the mole fraction of species A is y_{A1}. The mole fraction of species A at R_2 is y_{A2}. Drive the mass transfer rate of $W_{A,r}|_{r=R_1}$ at constant total pressure P ? (a)For the constant temperature at T_1, The product $C\,D_{AB}$ is constant. (b)For the non-isothermal problem, the temperature profile exists within the gas film, and the diffusion coefficient and the total gas concentration vary with temperature, this variation with *r* must often be considered. The temperature can be treated as $\frac{T}{T_1}=\left(\frac{r}{R_1}\right)^n$. The diffusion coefficient can be treated as $\frac{D_{AB}}{D_{AB}|_{T_1}}=\left(\frac{T}{T_1}\right)^{\frac{3}{2}}$. (The general differential equation : $\frac{1}{r^2}\frac{\partial}{\partial r}(r^2 N_{A,r})+\frac{1}{r\sin\theta}\frac{\partial}{\partial\theta}(N_{A,\theta}\cdot\sin\theta)+\frac{1}{r\sin\theta}\frac{\partial N_{A,\phi}}{\partial\phi}+\frac{\partial C_A}{\partial t}=R_A$) (20%)